WHAT IS CLAIMED IS:

1. A transmission antenna array apparatus of a base station in a mobile communication system having a mobile station that receives GPS (Global Positioning System) position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the apparatus comprising:

a position information generator for receiving the GPS position information from the mobile station and generating position information of the mobile station;

an array signal processor for calculating a weight vector using the position information to form a transmission beam; and

a forward processor having a transmission beamformer, for forming the transmission beam according to the weight vector in the direction of the mobile station through the transmission beamformer and outputting a transmission message to the antenna array by the transmission beam.

2. The transmission antenna array apparatus of claim 1, wherein the transmission beamformer forms transmission beams by generating as many transmission signals as M antenna devices by duplicating the transmission signal and multiplying each duplicated signal by a corresponding forward weight vector generated from the array signal processor, wherein M is a number of antenna devices.

3. The transmission antenna array apparatus of claim 1, wherein the weight vector is an optimum transmission array weight vector calculated by

$$w_T = k_T^{*} a(\theta, \phi, \lambda_T) \quad \ldots\ldots (11)$$

where w_T is the weight vector for the transmission array, k_T is an arbitrary positive real number, and λ_T is the wavelength of the transmission signal and $\theta$is an elevation angle of the z axis by a position data the mobile station receives from the satellite and $\Phi$is an azimuth angle by a position data that the mobile station receives from the satellites.

4. A reception antenna array apparatus of a base station in a mobile communication system having a mobile station that receives GPS position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the apparatus comprising:

a position information generator for receiving the GPS position information from the mobile station and generating position information of the mobile station;

an array signal processor for calculating a weight vector using the position information to form a reception beam; and

a reverse processor having a reception beamformer, for forming the reception beam according to the weight vector in the direction of the mobile station through the reception beamformer and processing a message received through the antenna array by the reception beam.

5. The reception antenna array apparatus of claim 4, wherein the reception beamformer obtains a final array output signal by receiving signals through M antenna devices, multiplying each antenna device output signal by a corresponding reverse weight generated from the array signal processor, and summing the multiplied signals, wherein M is a number of antenna devices.

6. The reception antenna array apparatus of claim 4, wherein the weight vector is an optimum reception array weight vector calculated by

$$w_R = k_R a(\theta, \phi, \lambda_R)$$

. . . . . (12)

where w_R is the weight vector for the reception array, k_R is an arbitrary positive real number, and λ_R is the wavelength of the received signal and θis an elevation angle of the z axis by a position data the mobile station receives from the satellite and Φis an azimuth angle by a position data that the mobile station receives from the satellites.

7. An antenna array apparatus of a base station in a mobile communication system having a mobile station that receives GPS position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the apparatus comprising:

a position information generator for receiving the GPS position information from the mobile station and generating position information of the mobile station;

a relative coordinates calculator for calculating relative coordinates of the mobile station with respect to absolute coordinates of the base station from the position information;

a position angle calculator for calculating a position angle of the mobile station with respect to the base station from the relative coordinates of the mobile station;

a weight vector calculator for calculating a weight vector using the position angle of the mobile station to form a beam; and

a beamformer for forming the beam according to the weight vector in an intended direction.

8. An antenna array apparatus of a base station in a mobile

communication system having a mobile station that receives GPS position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the apparatus comprising:

a position information generator for receiving the GPS position information from the mobile station and generating position information of the mobile station;

a relative coordinates calculator for calculating relative coordinates of the mobile station from the position information;

a position angle calculator for calculating a position angle of the mobile station with respect to the base station from the relative coordinates of the mobile station;

a distance calculator for calculating a distance between the mobile station and the base station from the relative coordinates of the mobile station;

a beam width controller for determining a transmission/reception beam width increment or decrement according to the distance between the mobile station and the base station;

a weight vector calculator for calculating a weight vector using the position angle of the mobile station and a beam width control signal to form a beam; and

a beamformer for forming the beam according to the weight vector in an intended direction.

9. The antenna array apparatus of claim 8, wherein a new weight vector w_{inc} is calculated to control the transmission/reception beam width according to the distance between the mobile station and the base station by

$$w_{inc} = \frac{w + \sum_{i=1}^{x-1} w_{+i} + w_{-i}}{\left\| w + \sum_{i=1}^{x-1} w_{+i} + w_{-i} \right\|}$$

.....(13)

where w is a unit weight vector in the direction of ϕ, $\omega_{\pm i}$ is a unit weight vector to form a beam in the direction of $\phi \pm i\frac{\Delta B}{2}$, i=1, 2, . . . , x−1, and x is a beam width increment predetermined empirically or by calculation according to the distance between the mobile station and the base station.

10. An antenna array apparatus of a base station in a mobile communication system having a mobile station that receives GPS position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the apparatus comprising:

a position information generator for receiving the GPS position information from the mobile station and generating position information of the mobile station;

a weight vector storage for storing optimum weight vectors versus position coordinates within a predetermined base station area in the form of a table;

a processor for selecting a weight vector corresponding to the position information of the mobile station or a weight vector most approximate to the weight vector corresponding to the position information from the table; and

a beamformer for forming a beam according to the selected weight vector in an intended direction.

11. A beamforming method for an antenna array apparatus of a base station in a mobile communication system having a mobile station that receives GPS position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the method comprising the steps of:

receiving the GPS position information from the mobile station and

generating position information of the mobile station;

calculating relative coordinates of the mobile station from the position information;

calculating a position angle of the mobile station with respect to the base station from the relative coordinates of the mobile station;

calculating a weight vector using the position angle of the mobile station to form a beam; and

forming the beam according to the weight vector in an intended direction.

12. A beamforming method for an antenna array apparatus of a base station in a mobile communication system having a mobile station that receives GPS position information of the mobile station from satellites and outputs the GPS information representative of the absolute position of the mobile station, the method comprising the steps of:

receiving the GPS position information from the mobile station and generating position information of the mobile station;

calculating relative coordinates of the mobile station from the position information;

calculating a position angle of the mobile station with respect to the base station from the relative coordinates of the mobile station, calculating the distance between the mobile station and the base station from the relative coordinates of the mobile station, and determining a transmission/reception beam width increment or decrement according to the distance between the mobile station and the base station;

calculating a weight vector using the position angle of the mobile station and a beam width control signal to form a beam; and

forming the beam according to the weight vector in an intended direction.

13. A beamforming method for an antenna array apparatus of a base station having a weight vector storage for storing optimum weight vectors versus position coordinates in a predetermined base station area in a mobile communication system having a mobile station that outputs GPS position information, the method comprising the steps of:

receiving the GPS position information from the mobile station and generating the position coordinates of the mobile station;

detecting a weight vector most approximate to a weight vector corresponding to the position coordinates of the mobile station from the weight vector storage; and

forming a beam according to the detected weight vector in an intended direction.